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Nondogmatism

Stephen R. Cole PhD *

Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill

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PREFACE

The following is based on my remarks on receipt of the 2015 ACE award for outstanding contributions to epidemiology.

A great scientist and dear friend showed me it would be wise to open with a joke. Structured humor is not my forte. So I practiced and practiced on people in my office. Until, as an employee-retention effort, my chair asked me to stop.

So here is the joke: A philosopher and an epidemiologist sit down next to each other on a flight to DC. The philosopher says to the epidemiologist: Question everything! The epidemiologist replies: Why?

I was planning to speak on how epidemiology is a ship of Theseus. Given we are all on this ship together, we learn well by analogy and the ship is a neat paradox, it seemed appropriate and fun. But the lunchtime roundtable conversation about "Risk" [1] yesterday got me thinking. And I would like to take this opportunity to expound on three points. Every communication is miscommunication. Dogmatists cannot learn. And truth is shared reality.

Every communication is miscommunication

You and I are communicating, right now, over a wireless audio or visual channel. I do not know how to communicate some of the things I wish to say. And I definitely do not know the correct order in which to say them for you. There is no generally correct order because these ideas are not linearly structured. And even if there were a correct order, I have to use language to communicate these ideas to you. And language is an imperfect communication medium. Language is a subtle mathematics.

Richard Hamming said, essentially, that the words carry a message, but the words are not the message; because we could use other words ([2], page 73). We know the map is not the territory. The model is not the truth. But triangulation is important. And every communication is miscommunication.

Dogmatists cannot learn

The proof of this statement is found in the fact that no amount of evidence can alter a certain belief, also known as a point-mass prior. The act of holding any belief with certainty is dangerous to rational thought and knowledge. This fact begs a no-principle principle, or Jack Good's principle of nondogmatism ([3], p 30). This principle appears to be ontologically prior to Aristotle's first law of thought, or identity. Bertrand Russell succinctly described Aristotle's law of identity as: "Whatever is, is" ([4], p 47). So, the principle of nondogmatism might amend Aristotle (respectfully) as: "Whatever is, is; as far as we can see."

Dennis Lindley spoke about a principle similar to nondogmatism, he called it: Cromwell's rule ([5], page 104). In 1650, Oliver Cromwell wrote to the Church of Scotland: "I beseech you, in the bowels of Christ, think it possible you may be mistaken." In a 1960 interview, Russell said something to the effect of: "One should not be certain, or you are certainly wrong." This idea can be illustrated by a computer program with 2 lines. The first line is the command: Print the remark "Hello world." The second line is the command: Goto line 1. This loop is like dogmatism, there is no release.

But we do run into a little snag that you may have already anticipated ([6], page 348). Should we be dogmatic about the principle of nondogmatism? This snag or "Paradox of Nondogmatism" reminds me of the Liar paradox: "This statement is

* Corresponding author. Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Campus Box 7435, Chapel Hill, NC 27599-7435. Tel.: 919-966-7415.
E-mail address: cole@unc.edu.

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false." ([7], page 127). Some things may not be knowable. Or at least not knowable to us, now. This snag set aside, the principle of nondogmatism appears generally sound. Although skeptics churn (thankfully), there is resounding agreement by experts that uncertainties are best quantified by probability. Therefore, to minimize error, we best believe nothing with probability 1, even this advice.

Nondogmatists can learn. Richard Feynman wrote: "Experiment is the sole judge of scientific 'truth'."([8], page 1–1). I learn starting with an idealization which is composed of three central parts. First, we have an extension of Fisher's experiment [9], which we call "multiply randomized experiments." Second, we have Robins' nonparametric g computation algorithm formula [10], which I believe is a fundamental theorem of causal inference. Third, we have Efron's nonparametric bootstrap [11]. Amazingly, with the combination of these three ideas, we can learn without parametric models, in principle. We can nonparametrically identify and estimate well-defined counterfactual risk functions [1], and their uncertainty. This is a mathematics for causality; it leads toward a superatomic information- and decision-theoretic counterfactual probability logic.

But this is an idealization, like the continuum or triangles [12]. And no experiment is ideal. All real-life experiments are broken. Observational studies can be used to perform pseudoexperiments, but they are broken by design. And thought experiments often do not even include physical data. Such realities press us to face the fundamental problem of causal inference [13]. In trying to address this fundamental problem, we encounter high dimension settings, combinatorial explosions, and Bellman's curse of dimensionality ([14], page ix). These realities appear to require an infinite-dimension semiparametric theory [15,16], which when combined with stabilization using a Laplace ([17], page 19) or Good [3] Bayes/non-Bayes synthesis comprises what we call semi-Bayes semiparametric inference. But dogmatists cannot learn.

Truth is shared reality

What I can tell you clearly, what I know well, would not be very interesting to me, and perhaps not to you. But what I cannot tell you clearly, what I do not (yet) know well, is fascinating. The void between the known and the unknown; the edge of our understanding. New ideas seem to come from this void, but access is limited and miscommunications are abundant. Interestingly, irrationality seems important in creative works. And analogy seems critical to bridge from what we know to what we do not. So what is "truth?" First, we might prefer to speak of degrees of truth, measured as probability, rather than speak of the dichotomy of truth = 1 and false = 0. These are just the dangerous limits of dogmatism.

Truth is fact or reality, apparently. A fact is something that occurred or is the case, apparently. Reality is the state of things as they exist … apparently. From here on, I will omit the caveat "apparently," but it holds throughout. Existence, or reality, is that which persists independent of one's presence. But humans only have direct access to their own mind, and indirect access to each other's minds by imperfect communication. Therefore, truth can only be agreed-upon fact, or "a shared reality." Reality is what we can perceive and agree upon. Because reality is only what we can agree upon, consistency is important. Consistency has many guises, logical and otherwise. In its varied forms, consistency is central yet impossible to demand completely. Also, checkability (or empirical verifiability, or testability) is central in principle, but cannot be dogmatically required in practice. Indeed, many things are difficult to check, and some things may not be checkable. And time is short.

It remains indeterminate whether we can determine further epidemiologic truths, or probability laws regarding health and disease. Successes like smallpox and polio eradication efforts, smoking and radiation effects, and the treatment of human immunodeficiency virus and hepatitis C virus are highly encouraging. Epidemiologists should be proud. But if there are further such causal probability laws (I think there are), humans must learn them using our imperfect rules of thought.

Finally, we might want to guess at what might have been (the counterfactual), rather than simply learn what is (the factual). This appears to require metaphysics. Metaphysics are useful; like the triangle, integers, infinities, real numbers, random numbers, counterfactuals, and thought experiments. Ultimately, we all have our own preferences, or utility functions, that must be coherently combined with counterfactual probabilities to maximize expected utility, within reason, assuming we wish to make rational decisions. Interestingly, though (and a hint that I have something not quite correct), as noted by Good [3], one of us may stand alone on a point and only be vindicated later, if ever. Perhaps truth is more than shared reality? Regardless, my access to truth is only through our shared reality. We must act on what we learn. We must learn all we can. Truth is shared reality, apparently.

Last, thank you. I would like to thank Pythagoras, Aristotle, Newton, Bernoulli, Bayes, Hume, Laplace, Wittgenstein, Neyman, Fisher, de Finetti, Wald, Ulam, Turing, Good, Cox, Efron, Greenland, Pearl, and Robins. I would like to thank you, the membership of the American College of Epidemiology (ACE), the ACE leadership, the organizing committee for this meeting, and the ACE Awards Committee. I would like to thank my teachers, my students, my colleagues, and, especially, my family. Thank you, I am honored to receive this award.

Postscript regarding fundamental theorems: Counterfactual existence, consistency and exchangeability (or permutability) may be ontologically prior to the g formula, but each is perhaps too simple to be a fundamental theorem. Perhaps a fundamental theorem should relate seemingly unrelated features (e.g., fundamental theorem of calculus). The g formula relates the factual and counterfactual.

Postscript regarding the paradox of nondogmatism: If we are dogmatic about nondogmatism, then we fail to be nondogmatic. But if we are not dogmatic about nondogmatism, then sometimes we fail to be nondogmatic. This paradox might be undecidable like whether or not induction is valid, or at what level of our decision hierarchy to stop being overtly rational ([18], page 11).

Postscript regarding miscommunications: Miscommunications can be meaningful. Please do not read extreme pessimism into my message. Please do not take away the idea that communication is meaningless. If we are completely skeptical, then we are dogmatic. By the way, while we are on this topic, do nihilists believe in nihilism?

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